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WITH THE COMPLIMENTS OF THE AUTHOR.

THE ORIGIN AND PREVALENCE

OF

MYOPIA

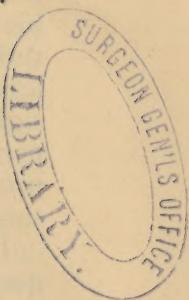
AMONG SCHOOL CHILDREN.

BY HENRY G. CORNWELL, M. D., YOUNGSTOWN, OHIO.



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THE ORIGIN AND PREVALENCE OF MYOPIA (NEAR-SIGHTEDNESS) AMONG SCHOOL CHILDREN.

HENRY G. CORNWELL, M. D., YOUNGSTOWN, OHIO.

"All day the vacant eye without fatigue
Strays o'er the heaven and earth; but long intent
On microscopic arts its vigor fails."—

The human eye is adapted when normal in refraction to bring to an accurate focal point, rays of light received from distances beyond twenty feet, on the retina. From these "infinite" distances, rays of light, although divergent to the extent of about three degrees, are practically parallel in their course. Briefly it may be said that the eye-ball is just long enough from pole to pole to receive the focus of such rays of light, on the retina after their refraction. If the length of the eye be increased or decreased, obviously it must be at a sacrifice of distinct vision of far-removed objects. If its limit exceeds that just considered, objects of which we desire to obtain a distinct retinal impression, will have to be brought closer to the eye, for it will be remembered that from points within a distance of twenty feet,—"finite" distances,—rays of light diverge, the increase in the divergence of the rays being proportionally greater as the object from which they are emitted is brought nearer to the eye. *The point from which rays of light proceed, is in direct relation to the focus of such rays after their refraction, when the one is approached the other in a certain proportion recedes.*

An eye-ball which exceeds the normal in its antero-posterior measurement is by reason of this change in its form capable of bringing *divergent rays only* to a focal point on the retina. This elongation of the bulb of the eye, in greater or lesser degrees, constitutes what is known as myopia,—short-sightedness or near-sightedness,—an interesting subject to parents, and teachers, inasmuch as statistical investigations prove to us that myopia is increasing to an alarming degree throughout the civilized world.

It is a matter of common observation that myopia is frequently found in several members of the same family, in parent and child, thus giving it is supposed, unmistakable evidence of heredity.

It is, however, frequently noticed that myopia can be acquired, and that its usual tendency is to progress; unless proper preventive action be taken, from bad to worse, leading in some instances to destruction of the globes and loss of sight. A German author (Donders—Anomalien d. Acc. u. Refrac. Wien, 1866) says, "A myopic eye is a diseased eye" * * * "In youth almost every myopia is progressive." * * * "On this point I cannot lay sufficient stress; every progressive myopia is threatening with respect to the future. If it continues progressive the eye will soon with troublesome symptoms become less available and not unfrequently at the age of fifty or sixty the power of vision is irrevocably lost."

As already noticed a myopic eye-ball is one which has undergone a change in form; it has become ellipsoidal, its long axis being in the direction of its axis of vision. The principal factors upon which this change in the shape of the bulb of the eye is dependant, are: 1st, The pressure of those external muscles upon it, by which means the globe is moved in all directions. This pressure is exerted during the prolonged convergence of vision of near objects, for it is obvious that in order to maintain *binocular single vision* the nearer an object is brought to the face, the greater will be the convergence required. 2nd, The accumulation of blood within the eye while stooping and straining to see small objects by imperfect light, soon leads to softening of the structural tissues of the globe, which in conjunction with the pressure of the extra ocular muscles, causes it to yield at the point where its support is the weakest—the posterior pole, hence the increase in length of the globe in the direction of the long axis of the

orbit. The factors thus active in the production of myopia are further active agents in causing it to progress.

Statistical investigations prove beyond question that the time of the developement of myopia is during the school-life of children and young adults. Dr. Ott Lucerne makes the following reflections on this subject at the conclusion of an extensive essay:—"From observations made upon the eyes of school children it has become a convincing certainty, that in the modern states of culture, the schools, especially the higher ones are true brooding places of myopia. That the most active factor for exciting near-sightedness is the schools is shown through its progressive increase during school years, through its infrequency among people who only attend school a few years, or not at all, through its extraordinary infrequency among the half-civilized nations, e. g., Negroes, Kabyles, and Hindoos."

"For the developement of myopia, inheritance must be taken into consideration, *but it plays by no means so important a role as the sort of work performed by the eyes.*† Myopia is very seldom in itself inherited, simply the foundation for it, e. g., a greater thinness of and more yielding nature of portions of the investing membranes of the eye,—till the time of attending school, one usually seeks in vain for myopic eyes, even among children both of whose parents are myopic. It is certain that the highest grades of myopia are met with where both inheritance and lack of school hygiene combine, but it is none the less certain children with the foundation for myopia can be permanently kept free from it. On the contrary we often find that school children free from hereditary conditions, can through overstrain of the eyes during early life, suffer from a high degree of myopia."

Ware, who wrote on this subject in 1813,‡ observed that myopia increased with the age of the pupil, and that it was more frequently found in cities than in the country. Ruete, who wrote in 1866,§ credits improperly lighted school rooms with being one of the chief factors in its production.

* Allg. Wiener Med. Zeitung, No. 33, Aug. 13th, 1878.

† Italics my own.

‡ Observations Relative to the Near and Distant Sight of Different Persons.—J. C. Ware, F. R. S., Phil. Trans. Royal Soc. 1813.

§ Untersuchungen über die Augenkrankheiten bei Schulkindern, Zeitschrift für Medizin, Chirurgie, u. s. w. Uene Folge, B. v. Heft. 4, Leipzig 1866.

A few facts with regard to the relative frequency of myopia before passing to a consideration of the conditions which favor its development.

Dr. Cohn of Breslau, published in 1867* the results of an examination of the eyes of 10,060 school children; the proportion of myopes in the different schools from the lowest to the highest is given in the following table:

Elementary School,	- - - -	6.7 per cent.
Intermediate School,	- - - -	10.3 "
High School (Realschule),	- -	19.7 "
Colleges (gymnasia),	- - - -	26.2 "

In the high schools one-half of the first or highest class were myopic. In the colleges the sixth or lowest class contained 12.5 per cent. of myopes, while the first class contained the enormous percentage of 55.8 of myopic students.

"Lately Erisman has published carefully prepared statistics of the refraction of pupils in the schools of St. Petersburg. Four thousand three hundred and fifty-eight scholars were examined. Of these 30.2 per cent. were myopic. Here, as in Cohn's tables, a comparison of the different classes shows a startling increase from year to year in the number of myopes. Among children of eight years of age, 10.2 per cent. were found to be myopic. Among the pupils of twenty years myopia was found in 40 per cent. of all examined." (Derby.†)

Drs. Cheatham, Derby, and Loring, in New York, Williams, in Cincinnati, Prout and Mathewson, in Brooklyn, (*Boston Medical and Surgical Journal*, May 27th, 1875,) observed as a result of investigations as to the prevalence of myopia among American school children a marked advance in the number of cases from the lower to the higher classes in schools and colleges. The following are some of the conclusions of Dr. Loring in a paper—Is the human eye changing its Form and becoming near-sighted, under the influence of Modern Education. (*New York Medical Journal*, Dec., 1877.‡)

"He said that hereditary influence was an important element in the production of myopia, and although statistics did not strongly endorse that view he still held that legendary information should receive much credence. In regard to the in-

*Dr. Cohn, *Untersuchung der Augen von 10,060 Schulkindern*, Leipsic, 1867.

†Myopia and its Operative Cure. Richard H. Derby, M. D., N. Y.

‡An abstract in *Medical News and Library*.

fluence of modern education, it was found that a larger proportion of those living in the cities where intellectual pursuits were greatest, the largest number of myopes were found. In savage nations nearsightedness was very infrequent and it would seem that it was the result of education. While the intellectual classes in Germany showed a large proportion of myopia, it was not so found in those artisans who used their eyes on fine objects as watch-makers and wood-engravers."

"Impaired nourishment, imperfect ventilation, together with a sedentary life, had a marked tendency in producing laxity of the tissues in general, *including of necessity the coats of the eye-ball*; and, with the tension which resulted from close application of the sight, there was a great probability of *lengthening of the eye, or myopia resulting.*"

"In the United States the normal eye predominated, and he thought it was due to the fact that the young were more in the habit of indulging in out-door sports than in Germany. The same was true of England. From a careful analysis of the myopic cases it was found that between the ages of ten and fifteen the majority developed; or in other words, at that time the tissues of the globe were more readily affected by strain of the muscles of the eye. It could be easily understood, under such an hypothesis that the industrial classes were so little liable to near-sightedness, for they seldom reached the practice of the more intricate branches of their trade before their eighteenth year. In conclusion, Dr. Loring was of the opinion that under proper precautions the normal eye could be continued indefinitely. If children were not allowed to apply themselves too closely to their studies between their eighth and sixteenth years and were, moreover, allowed the proper amount of out-door exercise not much damage need be dreaded. It was also important to have the schools perfectly ventilated and other hygienic conditions made as perfect as possible"

This paper which I had the pleasure of hearing Dr. Loring read before the N. Y. County Medical Society, excited an interesting and prolonged discussion on the hygiene of the eyes of school children being participated in by a number of prominent oculists present.

The prevalence of myopia in Germany is alarming. As the land of student industry it has gained for itself the name of "the land of myopes." The English journal, *Nature*, says:

"The alarming rapidity with which short-sightedness is increasing among German students formed the subject of a recent debate in the Prussian parliament. From extended observations made in the gymnasia, it appears that the number of the short-sighted increases from 23 per cent. in the first year to 75 per cent. in the ninth or last year.

The too frequent custom in Germany of forcing the lads to study during the evenings, with insufficient light, in ill-ventilated rooms, is undoubtedly a main cause of this wide-spread evil."

Nationality has largely to do with the developement and progression of myopia. Erisman's statistics, obtained from an examination of the eyes of 4358 scholars, revealed the fact that myopia was present in the lowest classes to the amount of 15 per cent. while in the highest it had increased to 42.8 per cent. Max Conrad examined 3036 eyes in Konigsberg and found in the lowest classes 10 per cent. and in the highest 62.10 per cent. of myopia. Drs. Derby and Loring examined 2265 eyes in New York and found myopia in the lowest classes to be about 3 per cent. while in the highest classes 26.79 per cent. was found. The following is a combined table:*

	Lowest Classes.	Highest Classes.
American, - - -	3 per cent.	26.79 per cent.
Russian, - - -	15 "	42.8 "
German, - - -	10 "	62.10 "

Dr. Loring in discussing the subject of heredity influencing myopia in the paper from which I have quoted, says: "As an additional means of estimating the effect of heredity on myopia, a comparison was made as to the frequency in which myopia occurred in the three principal nationalities of which our public schools are composed, that is among the pupils, of German, American and Irish parentage. It was found that of all the German scholars 24 per cent. were myopic, of the Americans 20 per cent., and of the Irish 15 per cent.; so that even in this country, and under the same school influences, myopia occurs more frequently among the Germans than among either the Americans or Irish. The comparatively low percentage of myopia among the Irish is certainly remarkable."

* Are Progressive Myopia and Conus Due to Hereditary Predisposition or can they be Induced by Defect or Refraction Acting through the influence of the Ciliary Muscle.—E. G. Loring, M. D., New York, 1877.

Dr. M. Reich in a recent paper (*Einiges über die Augen der Armenier und Georgier in den Schulen von Tiflis*)* reports having found in an examination of 1258 school children at Tiflis, myopia present in a lesser degree in the Russian than in Georgian and Armenian pupils. The following is the table:

	unter d. Russen	unt. d. Armeniern	unt. d. Georgierern
Im Classischen Gymnasium,	30 per ct.	38 per ct.	45 per ct.
Im Madchen-Gymnasium,	30 "	24 "	21 "
In der Stadt-Schule,	2 "	14 "	14 "
Im Lehrer Institute,	8 "	25 "	10 "

The highest degrees of myopia were also found among Armenian and Georgian pupils.

From this consideration of the subject thus far it is found that myopia is a disease, of childhood and youth almost exclusively, having its origin in the strong convergence of the visual axis necessary for vision at very near distances, by which means, pressure is made by the external muscles on the eyeball, and the congestion and consequent softening of the tunics of the globe during stooping and straining efforts to see. Obviously imperfectly-lighted school-rooms, the small type of text-books, low desks, etc., favor these conditions.

Usually progressive myopia becomes stationary after full adult growth is attained. Very rarely does it make its appearance after this time. It is manifest then that its hygienic management should be undertaken during the early periods of life. Galezowski, a French writer, says:†

"The importance of observing the hygiene of the eyes is much more important with regard to children going to school or entering upon apprenticeship; and in order that their vision be not permanently damaged, it is necessary that the occupations which they are called to should be carried on under the best hygienic conditions, and especially that the school-rooms and work shops be properly lighted. Every child on entering a school should have its eyes minutely examined by a medical officer or oculist attached to the school, or by one employed by the parent, a certificate being furnished in which is stated the refractive power of the eyes, the sharpness of vision, and all other particulars necessary for a knowledge of the exact

* Archiv Fur Ophthalmologie, Band XXIV, Abth. III, 1878.

† The Monthly Abstract of Medical Science.

state of the eyes in each student. The eyelids should also be very carefully examined in order that any child suffering from contagious granular ophthalmia may be refused admission. An exact knowledge of the sharpness of vision of each child is indispensable, in order that arrangements may be made in conformity with individual aptitude and range of vision. Thus, it is usual in classes to place children according to their merit, at the top or bottom—a practice indeed proper enough in the pedagogic point of view; but it may happen that those who are myopic get placed too far off from the blackboard, so as to have to strain their eyes very injuriously. In order to see better such children make immense efforts, winking and nearly closing the eyelids, and inducing spasmodic and involuntary contractions of the accommodation muscles, which, according to the accurate observations of Dobrowalski, contribute to the developement of progressive myopia. The most effectual means of preventing this is to suppress the efforts at accommodation and to facilitate children seeing at both long and short distances. Here arises the question as to whether myopic children should employ glasses; and the answer is, that they should do so if the myopia is very considerable, and should not wear them when the myopia is but slight, and capable of being obviated by placing the subjects of it near the objects of their study. So that the place of a child in its class is really a hygienic question to be seriously considered."

From my view many children are sent to school when too young; cases in illustration of this fact come under the observation of the oculist daily. Taking the eyes as an index to the entire physical organization, most children are attending school soon enough when eight years old.* I am aware that

* In Ohio pupils are admitted to schools at six years of age, as also in the following other states: Pennsylvania, West Virginia, Maryland and the District of Columbia, Indiana, Illinois, Nevada, Kentucky, Tennessee, North and South Carolina, Georgia, Florida, Louisiana, Texas and the Territory of Arizona—seventeen divisions in all. The still larger number of twenty-one states and territories have five in the statutory enactment for admission, viz.: Vermont, Massachusetts, Rhode Island, New York, New Jersey, Delaware, Virginia, Alabama, Mississippi, Arkansas, Missouri, Michigan, Iowa, Kansas, Nebraska, Minnesota, Colorado, Dakota, Wyoming and California. Then there are eight other sections, Maine, New Hampshire, Connecticut, Wisconsin, Oregon, Montana, Washington and Utah, that have placed the minimum age as low as four years. The Cherokee nation and New Mexico have adopted seven, while the Creek nation think that ten years is young enough to commence the education they have ready for them. The foreign nations whose school laws are at present accessible, are England, Scotland, France, Switzerland, Sweden and Germany, all six years; which age in the last mentioned is compulsory.

on this point much has been written and said by teachers,* and on this account I almost consider it forbidden ground, but it is a matter which interests the physician as well. It must be remembered that nervous force in children is quickly exhausted, and when lost is not so easily restored; moreover that affections of the eyes are frequently but local manifestations of a want of proper tone or vitality; indeed in many instances I believe we should accept them as precautionary signals, serving to warn us of disaster—consumption and insanity—ahead.

Generally speaking I believe that school desks should be made much higher than they are at the present time. Myopic pupils† especially should be provided with high desks in order to obviate the necessity of holding the head low. This is a matter of much importance. Children with normal sight readily cultivate the habit of holding books close to the face, thus bringing about too great a strain on the muscles of convergence. Heavy books are laid on low desks or in the lap, requiring the head to be bent forward in order that its pages may be clearly seen. Myopes particularly should sit with head erect and hold the book as near as possible in the same plane as that of the eyes.

"In regard to the illumination of school rooms, daylight should always come from the left side in relation to the students, and never from the right or the front. This direction of the light is especially favorable for writing, as the hand does not then project its shadow on the copy-book. Benches should not be placed opposite windows, for too much light is prejudicial; nor should the classes ever be ranged towards the south, working being very fatiguing with the sun on the windows. Photographers and painters so well understand the inconvenience of this that they always choose their studios with a northern or eastern aspect."—(Galezowski.)

Finally it must be remembered that a myopic eye is a diseased eye, and that with the higher degrees of error such an

* See a recent paper "What shall be the Minimum School Age?" By M. S. Terrell, Cincinnati, Ohio, *Educational Monthly*, September, 1879.

† The fact that pupils hold their books close to the face, does not in all instances indicate the presence of myopia. Persons who are farsighted to a high degree are required to do the same, as are also persons who have some affection of the optic nerve or other disease within the eye by which the visual sensibility of the organ is impaired; in the latter instance the object is brought nearer the face in order that a larger retinal picture may be obtained.

amount of structural change has taken place within the eye ball, that normal vision cannot be restored even by wearing proper glasses. Frequently in such cases vision equals but $\frac{2}{3}$, $\frac{1}{2}$, or $\frac{1}{3}$ of normal. Further than this: sudden blindness is in some instances a sequel of high degrees of myopia, through a rupture of some blood vessel with hemorrhage into the eye ball—a melancholy end for which surgical treatment is without avail.

Rules such as the following should be introduced into our schools for the guidance of teachers in these important matters:

I. See that pupils hold their heads erect, and their books as near as possible on a level with the eyes, and at a distance of from twelve to fifteen inches from the face.

II. See that the desk selected for the pupil be of such height that no stooping is required in writing and similar exercises.

III. If you suspect that a pupil is myopic, direct the attention of the parents to the fact, in order that proper glasses may be obtained. Give such persons high desks in well-lighted portions of the room, the light coming from the rear.

IV. The master should face the south.

V. Out door exercise should be encouraged, more particularly among subjects whose pale and cachectic appearance indicates a lack of proper vitality.

I wish to avoid any reference in this paper to the hygiene of schools, a subject very interesting and important in this connection, since the limits of a journal article has been reached. The annexed bibliographical list will, it is hoped, prove to be of value to those who are interested in the subject. *Hygiene de la vue les Ecoles, Bull de Med. pub. 1877-79. par E. Trelat, Par. 1879.*—The use and abuse of eyes in school rooms, V. S. Lindsay, M. D., *Trans. Med. Soc. Tennessee, Nashville, 1879.*—Report of the Northampton County, Va., committee on school hygiene, *Easton Daily Express, Aug. 21, 1879.*—*Die Stellung des practischen Arztes zur Realschulfrage, Hedler, 1879, Hamb.*—Sanitary condition of air in public schools, N. F. Lupton, M. D., *Chem. News, Lond., 1879.*—Hygiene of public schools in Massachusetts, D. F. Lincoln, M. D., *Bost., 1879, Rand, Avery & Co., 69 pp.*—The education of girls, as connected with their growth and physical development, N. Allen, M. D., *The Sanitarian, N. Y., 1879.*—School Hygiene, D. F. Lincoln, M. D. *Cycl. Prac. Med. (Ziemssen)*

N. Y., 1879.—The Hygiene of the School room in its Relation to Sight, *Gazette Hebdomadaire*, reprint, *Med. News and Abstract*, Jan. 1880, H. C. Lea, Phil.—Reherches d' hygiene scolaire, Marseille Med., 1879.—Our public schools; defective ventilation and brain poisoning. *The Sanitarian*, N. Y., 1879.—Emotional Prodigality, C. Fayette Taylor, M. D. “*Dental Cosmos*,” July, 1879, Phil.—De school, van een geneeskundig standpunnt beschouwd, Utrecht, 1879.—Medical Inspection of schools (Edit.) *Public Health*, N. Y., 1879.—School Hygiene (Edit.) *Med. Record*, N. Y.—Die schul hygiene auf der Pariser Weltausstellung, 1878. Bresl., 1879, Morgenstern, 48 p., 2 pl. m. 1 50. The heating and Ventilation apparatus of the Glasgow University, *San Rec.*, Lond., 1878—Ein Vorschlag die exorbitante Vereinigung der Schul-luft hinzuhalten. *Deutsche Vrtlgechr. f. off Gendhtspflg.*, Bruschwg, 1878, F. W. and W. Hesse.—On the Sanitary condition of the public schools of the city of N. Y. Report of especial committee (J. R. O'Sullivan and others) of the N. Y. Med-legal Soc. to the committee on hygiene of the Med. Soc. of the State of N. Y. *Trans. Med. Soc., N. Y.*, 1878.—The perils of education in N. Y. and Brooklyn. Another suppressed report. *The Sanitarian*, N. Y., 1879.—District school hygiene, H. Jewett, M. D., *Trans. Med. Soc. N. Y.*, 1878.—School hygiene E. V. Stoddard, M. D., *Trans. Med. Soc. N. Y.*, 1878.

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CONTENTS:

ORIGINAL COMMUNICATIONS :

Principles Underlying the Code, T. C. Miller, M. D., Prof. of Obstetrics Med. Dept. Wooster University.....	Page I
The Origin and Prevalence of Myopia (nearsightedness) Among School Children, Henry G. Cornwell, M. D., late Resident Sur- geon Brooklyn Eye and Ear Hospital.....	10
Syphilis, Part I. (Pathology and Treatment), Roswell Park, A. M., M. D., Demonstrator of Anatomy, Chicago Medical College ...	21

FOREIGN CORRESPONDENCE :

Medical Education in the London Hospital, W. T. Corlett, M. D., Cleveland, O.....	28
--	----

MEDICAL SOCIETY NEWS :

Ashtabula County Medical Society.....	29
---------------------------------------	----

OBITUARY RECORD :

A. E. Bearbower, M. D., Hudson, O.....	31
Alvin Belding, M. D., Ravenna, O.....	31
Samuel McKinney, M. D., Mineral Ridge, O	32

BIBLIOGRAPHY	33
--------------------	----

OHIO STATE MEDICAL SOCIETY.....	34
---------------------------------	----

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